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PENSOFT

New record of *Clinodiplosis capsici* Gagné, 2000 (Diptera, Cecidomyiidae), a sweet-pepper pest in Brazil

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Abstract. We report for the first time conical galls of *Clinodiplosis capsici* Gagné, 2000 (Diptera, Cecidomyiidae) on sweet pepper (*Capsicum annuum* L., Solanaceae) in Brazil. This report has agricultural importance since this midge is one of the known sweet-pepper pests.

Keywords. Agricultural importance, *Capsicum*, Gall, gall midge

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Introduction

Capsicum annuum L. (Solanaceae), commonly known as sweet pepper, is a plant native to southern North America, Central America, and northern South America. It grows primarily in wet tropical biomes (POWO 2022). This plant has edible fruits, used mainly to season food, but it also has ornamental, medicinal, and agroforestry use (Useful Tropical Plants 2014).

Galls on stems and leaves were found on *C. annuum* in Brazil. In the present study, we identify the gall-inducing midge species and discuss its geographical distribution.

Methods

We examined individuals of *Capsicum annuum* cultivated in commercial greenhouses located in Iranduba, Amazonas state, Brazil. On 24 August 2022, we removed branches with galls from the host plant and kept them in ventilated cages at room temperature in the laboratory until adult emergence. We first preserved emerged adults, pupae, and larvae taken from galls in 70% ethyl alcohol. Later, we mounted these specimens on microscope slides following the methods outlined by Gagné (1994). We used Gagné's (1994) key to identify the gall midge genus, and we identified the species after comparison with data from the literature (host plant, gall morphology, and cecidomyiid descriptions). We deposited all specimens in the Cecidomyiidae Collection of the Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ).

We carried out morphological studies and photographed specimens with the aid of an optical microscope with coupled camera.

Results

We identified the gall-inducing species as *Clinodiplosis capsici* Gagné, 2000 (Diptera, Cecidomyiidae), one of the known pests of sweet pepper, which has been reported in Guadeloupe, Puerto Rico, Costa Rica, and French Guiana (Gagné and Jaschhof 2021). This midge induces galls on stems, leaves, and the bases of flowers.

We observed galls on stems and leaves in great abundance (Fig. 1). Little is known about its life cycle. However, we observed that the period of adult emergence lasted 12 days. This is the first record of *C. capsici* in Brazil.

Material examined. BRAZIL – **Amazonas** • Iranduba; 03°08′36″S, 060°20′11″W; 24.VIII.2022; M. Garcia leg.;

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Figure 1. Galls induced by *Clinodiplosis capsici* Gagné, 2000 (Diptera, Cecidomyiidae) on stems and leaves of *Capsicum annuum* L. (Solanaceae).

MNRJ, 5 ♂ MNRJ-ENT1-68895, MNRJ-ENT1-68901, MNRJ-ENT1-68902, MNRJ-ENT1-68903, MNRJ-ENT1-68905; 5 ♀ MNRJ-ENT1-68896, MNRJ-ENT1-68900, MNRJ-ENT1-68904, MNRJ-ENT1-68906, MNRJ-ENT 1-68908; 15 pupae, 3 slides, each with 5 pupae, MNRJ-ENT1-68899, MNRJ-ENT1-68894, MNRJ-ENT1-68907; 10 larvae of 3rd instar, 2 slides, each with 5 larvae, MNRJ-ENT1-68897, MNRJ-ENT1-68898.

Identification. *Clinodiplosis capsici* can be recognized by the following morphological characters: 1) adults: wing unmarked, R5 curved toward apex, joining C posterior to the wing apex; tarsal claw untoothed and curved near basal third; 2) male: hypoproct broadened at midlength, its sides bending slightly around aedegus; 3) female: first through seventh tergites entire and rectangular, eighth tergite unsclerotized, second through seventh sternites quadrate, ovipositor slightly protrusible, protrusible portion with setae only ventrally and laterally, cercus ovoid, with pair of apical sensory setae and scattered setae elsewhere; 4) pupa: antennal base projecting anteriorly, abdominal terga 2–8 with dorsal enlarged spines; 5) larva: prothoracic spatula with two widely separated anterior teeth, the space between weakly indented; corniform papillae of the terminal segment small and not each situated at the end of lobes. This last character is distinctive of *C. capsici*, as no other congeneric species exhibit the same makeup of the terminal papillae (Gagné et al. 2000). Furthermore, the gall is the extended phenotype of the gall-inducing species, as each species induces a gall morphologically unique on its host plant (Stone and Schönrogge 2003).

Discussion

Clinodiplosis capsici was previously known in Guadeloupe, Puerto Rico, Costa Rica, and French Guiana (Gagné and Jaschhof, 2021). This gall midge was described from Central America, and later it was reported in French Guiana and now in northeastern Brazil (Fig. 2). Our new record expands this species' geographic distribution by about 1,095 km to the south. The high infestation of *C. capsici* indicated that this species can be an important pest of sweet pepper in Brazil. Therefore, knowledge of its biology is essential to establish ways to control it.

Other two gall midges have been reported on *Capsicum annuum*: *Asphondylia capsicicola* Uechi, Yukawa & Tokuda 2016 in Indonesia (Java, Sumatra, Bali), Vietnam, and India; and *Asphondylia gennadii* (Marchal 1904) in Italy, Malta, Greece, Cyprus, Turkey, and Israel. Neither of these species have been reported so far in the Neotropics (Gagné and Jaschhof 2021). The former is an oligophagous species as it induces galls on

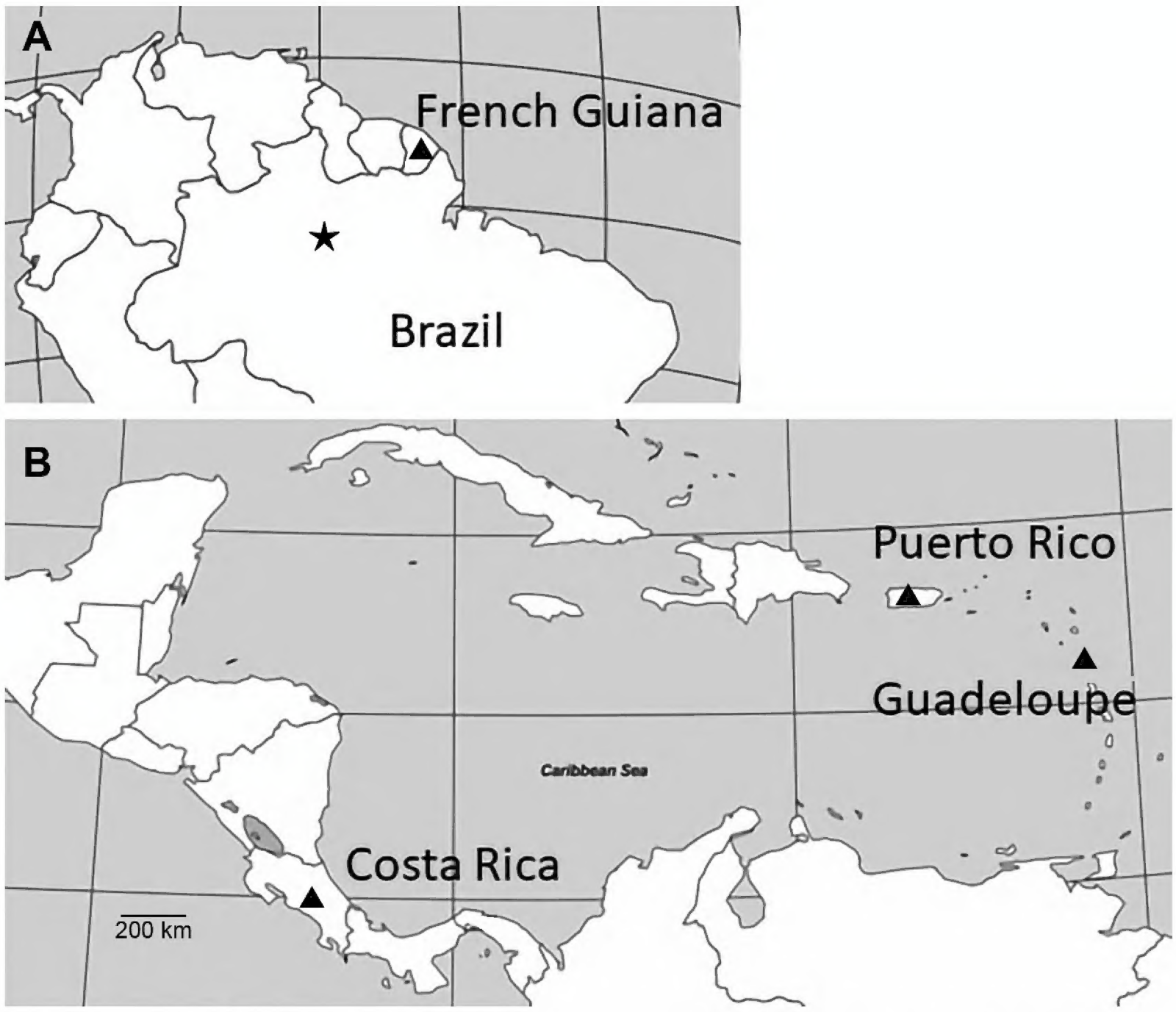

Figure 2. Current geographic distribution of *Clinodiplosis capsici* Gagné, 2000 (Diptera, Cecidomyiidae) in (**A**) northern South America and (**B**) Latin America. ▲ = previous records; ★ = new record in Brazil.

Capsicum frutescens L., whereas the latter is polyphagous as it induces gall on several plant genera and families (Gagné and Jaschhof 2021). Differing from both, *Clinodiplosis capsici* is species-specific.

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Author Contributions

Conceptualization: VCM, MVBG, RFB. Data curation: VCM, MVBG, RFB. Formal analysis: VCM, MVBG, RFB. Visualization: VCM, MVBG. Writing – original draft: VCM. Writing – review and editing: VCM.

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